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December 16, 1993

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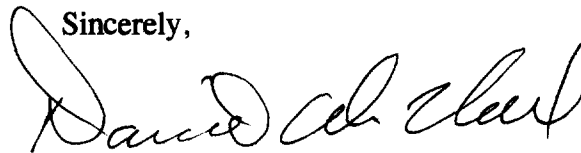
William F. Caton
Secretary
Federal Communications Commission
Room 222
1919 M Street, N.W.
Washington, D.C. 20554

Re: Ex Parte Presentation: PR Docket No. 93-61
Automatic Vehicle Monitoring (AVM) Systems

Dear Mr. Caton:

On December 15, 1993, Ronald L. Mahany and the undersigned, representing Norand Corporation ("Norand"), met with Richard Engelman of the Office of Engineering and Technology regarding the above-referenced proceeding. Norand's presentation focussed on the potential for disruption of Part 15 spread spectrum operations in the 902-928 MHz bands created by migration of high-powered narrowband AVM systems. The points discussed were those made in Norand's comments in this proceeding and in the attached handout.

Sincerely,



David Alan Nall

Enclosure

cc: Mr. Engelman

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Location and Monitoring Service
PR Docket No. 93-61

Presented by:
Norand Corporation

Norand Overview

- 25 years old, approximately \$160 million annual sales
- Pioneer in mobile computing, 10th year producing RF products
- R&D expenditures equal more than 10% of overall sales revenues
- Produces handheld and industrial-mobile computer products
- 50% of products incorporate interactive RF data communications capabilities
- Offer Part 90 (450 MHz) and Part 15 spread spectrum product lines
- U.S. sales of RF products account for approximately 35% of product and service revenues, nearly 20% of revenues from exports in FY '93

Primary Markets -- Material Movement and Control Applications

- Warehousing, manufacturing, transportation automation
- Accounts are primarily Fortune 500 companies
- Early customers in the automotive, electronics, chemical industries

Applications

- On-line systems replace paper-based approaches
- Increase productivity, eliminate errors, increase overall competitiveness
- Mission critical -- when the system is down, operations cease
- Typical customer payback < 12 months

Design Philosophy --

Market Need: Higher Performance On-Line Systems

- Part 90: Entry level solution
 - Simple system architecture, low data rates
- Part 15: Performance solution
 - Higher data rates, larger terminal populations, intelligent system architecture

Design Philosophy --

Part 15 Regulations as of 1989-90 (including 1990 rewrite)

Band Sharing Philosophy	Low power, low energy density secondary users -- §§ 15.249 and 15.247
Regulatory Quality of Implementation Requirements	Minimum process gain, maximum power spectral density limits
Known and Readily Characterized Primary Users in 902-928 MHz	ISM, government, amateur, experimental AVM

Norand Implementation

Spread spectrum as a technical advantage, not a regulatory loophole

Low Detectability	<ul style="list-style-type: none">• Low risk of interference to primary, other secondary users
Interference Mitigation	<ul style="list-style-type: none">• Known interference sources in band were targeted• Strategy based upon power levels, bandwidths, usual installation locations, duty cycles• Shielding due to building losses• Users control their own facilities, local coordination possible

Norand Implementation (cont.)

Spread spectrum as a technical advantage, not a regulatory loophole

Multipath Immunity	<ul style="list-style-type: none">• Extremely important in indoor environments• Directly related to spreading bandwidth<ul style="list-style-type: none">→ Multiple access→ Chose "TDMA" over CDMA, CDMA an option
Design Characteristics	<ul style="list-style-type: none">• FCC process gain requirement with margin

LMS Risk

Proposed regulations place spread spectrum systems employing relatively higher process gain, normally a desirable attribute, at a disadvantage

Wideband Systems	
As a source of interference	<ul style="list-style-type: none">• Forward channel is primary risk, can be successfully filtered at additional cost• Reverse channel -- low statistical risk of interference
Vulnerability to interference	<ul style="list-style-type: none">• Spreading bandwidth reduces risk to these systems by approximately 8-10 dB over TIA analysis

LMS Risk (cont.)

Narrowband Systems	
As a source of interference	<ul style="list-style-type: none">• High ERPs and duty cycles• Interference distances of several miles possible based on allowed ERP• 902-904 and 926-928 MHz operation creates minimal problems due to band edge operation• Filtering an option to reduce effects at 902-904 and 926-928 MHz• 912-918 MHz operation changes fundamentally the characteristics of the band
Vulnerability to interference	<ul style="list-style-type: none">• High immunity applications will dominate, <u>e.g.</u>, passive tag systems

LMS Induced Costs

- Design modification
- Modifications to fielded equipment
- End user incurred costs -- downtime, retrofit
- Goodwill

Spectral Characteristics

